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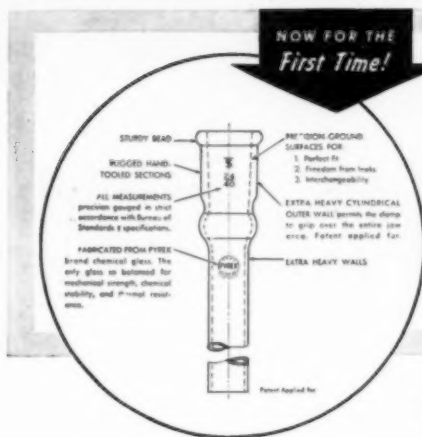
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VOL. XVII, No. 8

CHEMIST



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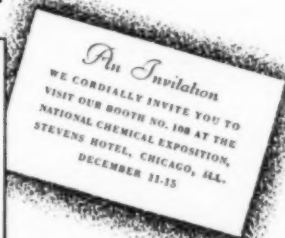
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The CHEMIST

Publication of

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IN THIS ISSUE

	Page
Teacher and Pupil—By Ed. F. Degering, F.A.I.C., and Rosemary Ince	361
The Young Chemist and the Government Service— By Louis Marshall, F.A.I.C.	365
Council	372
Chapters	373
Books	374
Northern Lights—By Howard W. Post, F.A.I.C.	377
The Science Angler—By Kenneth E. Shull, J.A.I.C.	378
Chemists	379
Boston Activities—By William B. O'Brien	382
Are We Educating for National Defense?— By Joel H. Hildebrand	383
Employment	386



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Teacher and Pupil

By Ed. F. Degering, F.A.I.C., and
Rosemary Ince,
Purdue University, Lafayette, Indiana.

I. THE NEF LINE OF CHEMISTS



Picture by courtesy of *Journal of Chemical Education*

C. Frederick August Kekulé, Teacher of von Baeyer

THE prime position of Germany in the dye industry may be attributed, to an appreciable degree, to the brilliant work of the great and original thinker, Frederick August Kekulé. To German parents in Darmstadt, Frederick Kekulé, the real founder of the structure theory, was born on the seventh of September, 1829.

Even in his youth his brilliant mind was evidenced by the excellence of his work in mathematics and drawing at the local gymnasium. His father, a Hessian "Oberkriegsrath" was thus influenced by the ability

of the lad to fit him for architecture. "Parents usually decide the life careers of their sons," said Kekulé many years later¹, but he proved to be a glaring example of non-conformity. At the age of eighteen, Kekulé went to Giessen and enrolled in courses in descriptive geometry, perspective masonry, and similar courses in preparation for his work as an architect.

The lectures of Justus von Liebig, however, then professor of chemistry at Giessen, fascinated him and under this influence and instruction, Kekulé soon knew that chemistry was to be his chosen work. With his father's death in August of that year, and upon the insistence of his relatives, who opposed his study of chemistry and hoped that he would outgrow his youthful whim toward it, he attended the Polytechnic School at Darmstadt for one semester. His interest in chemistry did not wane and he returned to Giessen in 1849. Three years later he was granted a doctor's degree in chemistry.

In 1850 he declined Liebig's offer of an assistantship. With the generous financial help of his step-brother, Karl Kekulé, Frederick went to Paris for a year's study. He attended the lectures of Dumas, and his interest in chemistry was greatly heightened by personal contact with Gerhardt and Wurtz, leading chemists of Paris.

After returning to Giessen for a short time, Kekulé left for Switzerland, upon the recommendation of Liebig, to become private assistant in the laboratory of Adolf von Plato. Even though this isolated position gave him ample opportunity for reflection on theoretical topics, Kekulé was dissatisfied. In January, accordingly, he went to London as an assistant to Stenhouse. There he also enjoyed personal contact with such leading English chemists as Williamson, Odling, and others.

"This training under German, French, and English masters of chemical thought was of invaluable aid to Kekulé, ridding his mind of one-sided prejudice. 'Originally a pupil of Liebig, I had become a pupil of Dumas, Gerhardt, and Williamson; I no longer belonged to any school. Free yourself from the spirit of the school, and you will then be capable of doing something of your own.'"²

Wishing to try out his own ideas, Kekulé returned to Germany and started a small chemical laboratory at Heidelberg. His equipment and supplies were meager and insufficient; nevertheless, he carried on many important researches.

In 1856 Kekulé was granted a license to teach organic chemistry

and, in his twenty-seventh year, began his pedagogical career by becoming privat docent at Heidelberg. Here Kekulé received little attention as Bunsen, who had little interest in organic chemistry, dominated the chemical field at Heidelberg. Kekulé, however, attracted a few students to his meager laboratory and among them was Adolf von Baeyer. While at Heidelberg, Kekulé published his celebrated paper: "On the Constitution and Metamorphoses of Chemical Compounds and on the Chemical Nature of Carbon". This work attracted international attention. The Belgian government, on the recommendation of Stos, offered Kekulé a professorship at Ghent, which was gladly accepted.

While at Ghent three volumes of his *Lehrbuch der Organischen Chemie* appeared. Of this Baeyer said: "Only such a man was capable of writing this *Lehrbuch* which relegated all previous ones into an almost forgotten past".¹

Kekulé remained at Ghent for seven years until he accepted in 1867 a position of similar rank at Bonn. The laboratory at Bonn, designed by A. W. Hofmann, was new, large, and well-equipped. In 1873 Kekulé declined to become Liebig's successor at Munich because of his contentment at Bonn. He had the pleasure of seeing his brilliant pupil, Baeyer, occupy the honorable position as successor to Liebig.

During the next twenty years, Bonn was filled with interesting and fruitful chemical activity. As early as 1876, at the age of forty-seven, because of failing health and increasing deafness, Kekulé began to shun even his closest friends. There was no impairment of his mental power, however, for he spent the later years of his life defending his own theories against work published by the opposition.

Upon his death on July 13, 1896, at the age of sixty-seven, Kekulé was buried in the Poppelsdorf Cemetery in the outskirts of Bonn. A bronze statute was erected to his memory in 1903 in front of the chemical laboratory at Bonn.

Kekulé's reputation as an incomparable teacher and lecturer as well as a genius in research attracted numerous brilliant pupils. His pupils strove to emulate his tireless activity. Anschutz Bernthsen, Bredt, Claisen, Glaser, Thorpe, von Baeyer, von't Hoff, Wallach, and Zincke, were a few of the pupils who were inspired by his tireless energy. Thus Kekulé, in his forty years of teaching at Heidelberg, Ghent, and Bonn, inspired his pupils by his original and thorough thinking.

Kekulé is remembered most for his work in the field of organic chemistry. His work with the carbon compounds is his most far-reaching contribution. In 1858 he published a paper giving reasons for

regarding carbon as a tetravalent element. He established the valence theory by setting forth the essential features of his famous doctrine of the linking of atoms. This idea led to the application of the valence idea to benzene and the postulation of its constitutional formula. He applied himself to the study of numberless organic bodies and their mutual relations. In visualizing the structural relation of compounds, the architectural training of Kekulé was of utmost importance. His work has served as a basis for the subsequent investigation in modern synthetic dyestuffs.

Kekulé says about his structural studies of benzene, "The benzene theory did not appear as does a meteor in the skies. Any student of the history of science knows that no science has developed more steadily than has chemistry. We all stand on the shoulders of our predecessors; is it striking then that we have a wider range than they."¹

Kekulé spent his time not only in the laboratory but also with his pen. His writings are numerous. The *Annalen der Chemie*, of which he was editor, contained most of his original contributions.

The value of the life and chemical research of Kekulé is recognized the world over. "Professor F. R. Japp, in the Kekulé memorial lecture he delivered before the London Chemical Society on the fifteenth of December, 1897, declared that three-fourths of modern organic chemistry is directly or indirectly the product of Kekulé's benzene theory, and that without its guidance and inspiration the industries of the coal-tar colors and artificial therapeutic agents in their present form and extension would have been inconceivable."²

Kekulé, himself, said about his work, "I have never worked for technical ends, always for science alone. I have always had the greatest interest in industrial matters, but I have never derived my interests from such sources. Let us learn to dream, gentlemen, then perhaps we shall find the truth . . . but let us beware of publishing our dreams before they have been put to the proof by the waking understanding."¹

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The Young Chemist and the Government Service

By Louis Marshall, F.A.I.C.

The sixteenth of a series of articles on the opportunities for chemists in the Government Service.

Bureau of Ordnance of the War Department

THE Bureau of Ordnance of the War Department is the agency responsible for providing the offensive and defensive arms and ammunition used by the Army. The task is a highly intricate one, involving as it does, continuous researches into the science of high explosives, propellant powders, delay powders, pyrotechnics, etc. This work is done at the Picatinny Arsenal in Dover, New Jersey. In addition, the Watertown Arsenal at Watertown, Massachusetts, conducts researches in metallurgy and engineering to determine the best materials and best designs for all kinds of rifles, anti-aircraft guns, and the many other arms used in modern warfare.

When the United States entered the World War, the necessity for extensive research in the chemistry of explosives quickly became evident. It was necessary to learn more about propellant powders, high explosives, and the raw materials necessary for their production. The lack of scientific data on these matters was a keenly felt hindrance to war mobilization and was only slightly mitigated by the assistance of the French and the British technical experts sent here for that purpose. Since the war, the Ordnance Department has carried out an orderly program of research leading to the production of the best types of arms and ammunition. Research in ordnance work is generally of a non-commercial character and it has therefore been necessary for the Department to rely largely though not entirely upon its own personnel and facilities for the solution of problems in ordnance.

It was necessary to investigate the causes of certain objectionable features in explosives. For example, some contained hygroscopic ingredients which absorbed enough moisture to render the explosive insensitive to detonation. In other cases, dangerous decomposition of the

explosive charges, after they had undergone storage for some time in warm climates, had to be controlled. Since no explosive, not even the standard trinitrotoluene, is entirely free from objectionable features, it became important to investigate new compounds to determine their suitability for military use. Those which are found satisfactory are studied further in order to develop industrial processes for their manufacture.

At the present time, the standard propellant used by the Army and Navy is a smokeless powder consisting of an ether-alcohol colloid of a medium grade of nitrocellulose. The basic material required in its manufacture is cotton which is first purified and then nitrated by treating with a mixture of nitric and sulphuric acids. The product contains about 12.6 per cent nitrogen, and goes under the name of pyrocellulose, pyrocotton, or frequently pyro. The function of this propellant is to overcome the inertia of a projectile in the barrel of a gun. It does this by undergoing a rapid combustion which progresses from grain to grain, thus building up a pressure at a more or less definite rate. The fact that the explosion of a propellant is not instantaneous but merely a rapid combustion, makes it possible to use it within the limited volume of the powder chamber of the gun. If a high explosive were used as a propellant, the gun would burst because of the terrific increase of pressure caused by the instantaneous liberation of its gaseous combustion products.

Although the standard pyro is, on the whole, a satisfactory propellant, being practically smokeless and causing but little erosion of the bore of the gun, it has certain marked disadvantages. It produces a brilliant flash at the muzzle of the gun because the products of its explosion are the combustible gases, carbon monoxide and hydrogen, both of which immediately burn on coming in contact with the oxygen of the air. The flash is undesirable because it serves to disclose the position of the battery. Another disadvantage of the pyro is its tendency to absorb moisture. This affects its ballistic properties and also its stability. The research laboratories at Picatinny Arsenal have worked on the problem using all the tools of modern physical, colloid, and organic chemistry, and have succeeded in making a propellant powder which is smokeless, flashless, and much less hygroscopic than the old type of pyro powder. Its exact mode of manufacture is not made public since it is the policy of all Governments to keep secret their discoveries of direct military value. It is no secret, however, that these

and related investigations require the services of very competent workers in physics, chemistry, metallurgy, engineering, ballistics, and other sciences.

Another problem of importance in ordnance work is concerned with pyrotechnics which are used in warfare for signal and illuminating purposes. The specialists in this field endeavor to work out new compounds and compositions which are capable of producing light of limited wave length. They study the relative stability of the pyrotechnic substances as well as the visibility of the signal lights which they are capable of producing under the wide variety of atmospheric conditions encountered in the field. The accumulation of more data on these necessary military agents will permit the rating of all signal devices with respect to the range at which they are effective under conditions of both day and night use.

The art of pyrotechny is a very ancient one. Centuries ago, it was known that mixtures of certain substances were capable of producing brilliant and startling effects when ignited. However, neither the nature of the substances nor the principles underlying their use were understood, and even up to the present time, pyrotechny is carried out largely by "rule of thumb" methods. It is, of course, known that all pyrotechnic mixtures contain a combustible substance like sulphur or carbon, and a supporter of combustion, as for example a metallic chlorate or nitrate. The purpose of the investigations in this field is to establish a more scientific basis for pyrotechny which will make possible the production of better and more uniform mixtures used for signal and illuminating purposes in warfare.

The laboratories of Picatinny Arsenal are located in modern buildings especially designed to reduce the hazards of explosion or fire. The investigations and tests on dangerous explosives and ammunition are carried out in a separate building. The work of the laboratories is divided into several sections. The analytical section maintains chemical control of the departments which manufacture smokeless powder and high explosives. The ingredients which are necessary for their production are tested for compliance with specification requirements. There is a stability section whose function it is to find better methods for the storage of explosives, and to determine the relative stability of different types of compositions. Finally, there is a research section. The specialists attached to it work in the fields of pyrotechnics,

land mines, low-altitude bombers, cellulose, nitrocellulose, high explosives, detonators, and fuse powders. Although most of the results obtained by this section are treated confidentially, others are published in standard scientific journals and in the publication entitled, *Army Ordnance*. Some of the discoveries are patented in the United States Patent Office.

The laboratories at Watertown, Massachusetts, are devoted to the testing of cast irons, steel, and non-ferrous alloys. This arsenal has a foundry for the production of all kinds of rifles, anti-aircraft guns, and other arms. There is thus an excellent opportunity for industrial chemists to gain practicable knowledge of the metallurgy of iron, steel, and bronze. These research laboratories may be credited with the development of molybdenum tool steels; the use of radiography to provide a non-destructive method for inspection and control in the manufacture of welds and castings, and the development of a quantitative spectrum analysis for the chemical control of foundry products.

In addition to the arsenals at Dover and Watertown, the Ordnance Department operates four others which also combine manufacturing facilities. The oldest arsenal, at Springfield, Massachusetts, is devoted to the manufacture of small arms. It was here that the semi-automatic shoulder rifle M1 was developed.

Rock Island Arsenal on the Mississippi River near Davenport, Iowa, maintains control and research laboratories for the study of armor plate steel castings, and other products. One of its research problems is to devise methods for preserving ordnance materials in storage.

Watervliet Arsenal is a great gun manufacturing center, possessing equipment for the production of small field howitzers as well as sixteen inch seacoast guns weighing 350,000 pounds.

Frankford Arsenal deals principally with the production of small-arms ammunition, artillery shells, fire control instruments for artillery, and aircraft listening devices.

The professional staff of the Ordnance Department of the Army includes twenty-six chemists, who are distributed among the grades, as follows: Two senior chemists, two chemists, three associate chemists, ten assistant chemists, and nine junior chemists.

THE Corps of Engineers of the War Department is the agency which is responsible for the construction of fortifications, roads, bridges, and other structures necessary to military operations. It prepares the maps which are indispensable in warfare.

Another highly important aspect of the duties has to do with its peacetime activities, and in this field, as well as in regard to its strictly military functions, the Engineer Corps can point to a remarkable record of achievement. The Panama Canal, the Washington Monument, and the Baltimore and Ohio Railroad, the first railway in America, are examples of diverse projects initiated and carried to completion by the Corps. The work of improving rivers and harbors for the betterment of navigation and prevention of floods is another of its important functions. The operation and maintenance of the fine water supply system of Washington, D. C., are responsibilities of the Corps of Engineers. In such an organization, it is not surprising to find that the services of chemists are needed for research and testing in connection with the vast quantities and large varieties of materials required in the conduct of its work.

The laboratory at Washington, D. C., is devoted to the testing of drinking water. The proper chemical treatment of raw water in its course through the filter plants is controlled and the finished water is examined chemically and bacteriologically to determine its quality. The chemists in this laboratory have worked out a new method for the determination of *Bacillus coli*, and other problems which arise in the purification and analysis of drinking water receive attention.

Another important laboratory of the Engineer Corps was the one at Fort Peck, Montana. It was primarily designed for the testing of materials used in the construction of Fort Peck Dam which was completed in 1939; the largest earth filled structure in the world. The dam was projected for the purpose of improving navigation on the Missouri River. It now fulfills this function and at the same time acts as a flood control agency, a source of irrigation and electric power. The wide variety of materials required for this vast construction work were brought under definite specification requirements, and the laboratory was well equipped for the chemical and physical examination of these materials. The most important commodities tested were: Cements, steel of different types, brass, fuels, lubricating oils, and paints. The methods used in the analyses of these items were for the most part the standard ones of the American Society for Testing Materials, the Federal Specifications Board, and similar authorities. The laboratory also conducted analyses on foodstuffs, drinking water, and other samples of a miscellaneous nature.

The Medical Department is the branch of the Army to which is entrusted all matters pertaining to the health of its men. Its personnel

includes Army physicians, surgeons, dentists, veterinarians, and enlisted soldiers. The latter undergo various types of training in Army schools, to learn pharmacy, routine bacteriological work, mechanical dentistry, and other occupations required for the efficient operation of a very large health enterprise. Some of these enlisted soldiers become expert technicians in carrying out the ordinary chemical analyses incident to hospital work. In every Army hospital, in fact, analyses of blood, urine, and other body fluids are conducted by these specially trained enlisted personnel.

The only laboratory of the Department which utilizes the services of civilian chemists is the one at 58th Street and First Avenue, Brooklyn, New York. This medical laboratory is devoted to the testing of a wide variety of materials including pharmaceutical preparations of all kinds, crude drugs, coal tar products, soaps, reagent chemicals, and the specially prepared silver-tin alloy used in dentistry. The quality of all these items, as well as many others used by the Medical Department, is safeguarded by purchasing them under definite specification requirements. For example, pharmaceutical products are usually required to conform to the specifications of such authorities as the *United States Pharmacopoeia*, the *National Formulary*, or the *New and Non-official Remedies of the American Medical Association*.

The drug products which are sent to the laboratory are naturally tested with great care since the success of the Medical Department in maintaining the health of the Army depends in no small measure upon the quality of the drugs it uses. To illustrate, a drug like acetanilid, which is employed in medicine to relieve pain or to allay fever, must conform strictly to the requirements of the *Pharmacopoeia*. Its melting point must be between 113° and 115° C. Its ash must not exceed 0.05 per cent. When 1 gram is shaken with 20 cc. of distilled water and then filtered, the filtrate must be neutral to litmus paper. In addition, the drug must conform to all of the other tests for identity and purity which are prescribed.

Codeine sulphate is another product which is purchased under the specifications of the *Pharmacopoeia*. It is used to relieve coughs and in some cases to allay intestinal pain. In order to insure against it being contaminated with a related alkaloid, morphine, the following test is made: About 0.56 grams of potassium ferrocyanide is dissolved in 10 cc. of distilled water. Then one drop of a solution of ferric chloride and 1 cc. of a 1:100 solution of the drug are added. If morphine is present, a deep blue coloration immediately appears. The purity of the

codeine sulphate is further determined by drying a sample to constant weight at 100° C. The loss in weight must not be greater than 12 per cent which represents its water of crystallization. The ash from 0.5 gram of the drug must be negligible. A solution of 0.5 gram in 15 cc. of distilled water must require not more than 0.3 cc. of N/50 NaOH for its neutralization using methyl red as the indicator.

Similarly, all of the hundreds of drug products which are purchased are tested by well-defined methods in order to establish their quality and purity. At the present time, the chemical work of this laboratory is done by four chemists.

The Quartermaster Corps of the War Department employs several chemists to do analytical work on miscellaneous commodities purchased by the Army. These include foodstuffs of all kinds, papers, inks, textiles, paints, metalware, etc. All of these articles are purchased by the method of advertising for bids. The advertisement states the nature of the article it is desired to purchase and the Federal specification or other standard with which it must comply in order to be acceptable. Those contractors who wish to receive the award submit sealed bids giving the price for which they will undertake to furnish the desired item. Then, on a stated day the bids are all opened, and the award given to the contractor who has submitted the lowest bid and who has declared his intention of complying with all of the other stated requirements. A standard Government contract, embodying the specifications which must be met, is drawn up. Then a representative sample is taken from each of the deliveries which the contractor makes, and sent to the laboratory for analysis. If it is found to meet all requirements, the delivery is accepted and payment is made. If not, the delivery is rejected and sent back. This straightforward method of purchasing assures the procurement of satisfactory commodities at the lowest price, and is at the same time fair to all who want to sell. This method of purchasing is the one that is employed by practically all of the departments and independent establishments of the Government.



"Science must begin with the student, and every opportunity must be given youth to gain a foundation for a life of science. If human advance is to continue, the student must be liberally supported Our educational institutions have shown conclusively that they deserve every support The opportunities for education should be broadened, for no one knows whence genius may arise."

—A. CRESSY MORRISON



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October Meeting

The one hundred and seventy-third meeting of The National Council of THE AMERICAN INSTITUTE OF CHEMISTS was held on October 3, 1940, at the Chemists' Club, 52 East 41st Street, New York, N. Y., at 6:30 P. M.

President Harry L. Fisher presided. The following officers and councilors were present: Messrs. E. R. Allen, Frank G. Breyer, Harry L. Fisher, Charles N. Frey, M. L. Hamlin, Walter J. Murphy, H. S. Neiman, W. T. Read, G. E. Seil, Norman A. Shepard, F. D. Snell, M. Toch, and Albin H. Warth. Mr. M. R. Bhagwat and Miss V. F. Kimball were present.

The minutes of the previous meeting were read and approved. The

Treasurer's report, showing a bank balance as of September 30, 1940, of \$2357.74 and a reserve fund of \$2500.00, with bills paid to date, was read and accepted.

Dr. Read reported plans for the Committee on Membership, and reported that he is forming a National Membership Committee to interest new members in all sections of the country.

Mr. Breyer discussed the employment of chemists in relation to the new defense program.

The Secretary reported that the following members of THE AMERICAN INSTITUTE OF CHEMISTS died since June, 1940: Paul DeM. Buckminster, William W. Buffum, Karl R. Lindfors,

James F. Norris, Wolf Kritchevsky, James H. Ransom, Jere K. Ross, Ludwig Saarbach, and Edward C. Uhlig.

Dr. Foster D. Snell reported for the New York Committee of the Committee on Legislation, followed by a general discussion of the subject.

Mr. M. R. Bhagwat reported progress for the Chemist Advisory Council. Mr. Breyer discussed future plans for the Council.

The following new members were elected:

FELLOWS:

Edmonds, J. Bernard

(1940), *Analytical and Consulting Chemist*, 3816 Greenmount Avenue, Baltimore, Md.

Reich, Gustave T.

(1940), *Technical Director*, Pennsylvania Sugar Company, Philadelphia, Pennsylvania.

ASSOCIATE:

Blotcky, Myron H.

(1940), *Chief Chemist*, Van Dyke Laboratories, Dallas, Tex.

The next meeting of the National Council was set for Wednesday, November 20, 1940.

Upon motion made and seconded, the Secretary was requested to invite the chairmen of the committees to be present at the meetings of the National Council.

There being no further business, adjournment was taken.



CHAPTERS

New York

Chairman, William Howlett Gardner

Vice-chairman, W. D. Turner

Secretary-treasurer, D. H. Jackson

17 John Street

New York, N. Y.

Council Representative, Marston L. Hamlin

Niagara

Chairman, J. Allan Camelford

Vice-chairman, Alvin F. Shepard

Secretary-treasurer, Wilbert A. Herrett

109 Norwood Avenue

Hamburg, N. Y.

Council Representative, Arthur W. Burwell

Carl H. Rasch, *Alternate*

News Reporter to THE CHEMIST, Margaret C. Swisher

Pennsylvania

Chairman, Addison C. Angus Vice-chairman, Edward L. Haenisch
Secretary-treasurer, Harold A. Heiligman
1203 West Oak Street
Norristown, Penna.
Council Representative, Gilbert E. Seil
News Reporter to THE CHEMIST, Kenneth A. Shull

Washington

President, Albin H. Warth
Vice-president, L. F. Rader, Jr. Treasurer, L. R. Heiss
Secretary, Martin Leatherman
9 Quincy Avenue, Hyattsville, Md.
News Reporter to THE CHEMIST, Alexander J. Stirton
Council Representative, Albin H. Warth

Executive Committee

J. R. Adams	H. C. Fuller	N. W. Matthews	W. H. Ross
M. S. Anderson	L. R. Heiss	J. W. McBurney	E. F. Snyder
A. P. Bradshaw	J. H. Hibben	A. L. Mehring	J. J. Stubbs
R. T. K. Cornwell	B. Makower	R. M. Mehurin	E. K. Ventre
P. R. Dawson	L. N. Markwood	A. R. Merz	C. W. Whittaker
R. B. Deemer		W. M. Noble	J. F. Williams

BOOKS

INTERMEDIATE CHEMICAL CALCULATIONS by J. R. Partington and Kathleen Stratton. Macmillan and Company. 1939. $5\frac{1}{2}$ " x 8" 239 pp. \$1.65.

The tendency has been, during recent years, to place more and more stress upon mathematics in the chemistry curriculum. This book, prepared by two of the staff of Queen Mary College of the University of London, is designed to supplement the necessarily limited mathematical calculations contained in regular chemistry texts. The authors

"do not regard a training in chemical calculations as a tiresome and perhaps unnecessary addition to the usual course of theoretical and practical study, but as a vital and integral part of the teaching, the occupation with which leads to that sense of mastery over obscure and vague details which should be an essential result of any scientific training".

Special attention has been given to clarifying the material which beginning college students frequently have difficulty in understanding. A sufficient number of problems is included to permit a choice and avoid unnecessary

boredom with too many problems of one kind. Scholarship candidates will find advance material for their review.

The subject matter is presented from the point of view of modern methods used in each branch of chemistry. The book is well bound and contains an appendix of useful tables and information. British spelling and punctuation are used throughout, as a result of its publication in Great Britain. Chemistry students will find this book useful to enable them to become more familiar with the mathematical calculations involved in modern chemistry.



CHEMISTRY AND MEDICINE. Edited by Maurice B. Visscher. *The University of Minnesota Press*. 1940. 6" x 9" 296 pp. \$4.50.

This volume contains fourteen papers delivered at the fiftieth anniversary of the founding of the Medical School at the University of Minnesota. Progress in the application of chemistry to medicine, including recent investigations in metabolism, immunity, chemotherapy, and nervous control of the organism are treated.

The contributors are: Herbert Freundlich, John P. Peters, Lee Irvin Smith, George O. Burr, Charles H. Best, Michael Heidelberger, Robert G. Green, Perrin H. Long, Henry F. Helmholz, Irvine McQuarrie, Herbert S. Gasser, Detlev W. Bronk, and Walter B. Cannon. Maurice B. Visscher, professor of physiology at the University of Minnesota, has edited these papers and grouped them into four parts: Progress in the Application of Physical Chemistry to Medicine; Some Recent Investigations in Metabolism; Some Aspects of Immunity and Chemotherapy; Some Approaches to the Nervous Control of the Organism.

These excellent papers on the trends

of medical progress with particular reference to chemistry in medicine are a welcome addition to the literature of a field which is making rapid advancement. Medicine and chemistry should cooperate more closely than at present for greater effectiveness in helping humanity. This is in line with the recent recognition of a need for the wider dissemination of truth learned in one branch of science through all branches of science for their mutual progress.

This book contains many charts, tables, pictures, and references to literature. It will prove most informative to all who are interested in the possibilities of greater application of chemistry to medicine.



CHEMICAL COMPOSITION OF FOODS. By R. A. McCance and E. M. Widdowson. *Chemical Publishing Company*. 1940. 5½" x 8½". 150 pp. \$2.50.

The material in this book is taken from the authors' twelve years of experience in food analysis at King's College Hospital at the University of Cambridge. Five hundred and forty-one common British foods are analyzed for their important organic and mineral constituents, with the exception of the vitamins which are omitted.

The list of foods includes prepared products and cooked foods as well as raw foods, classified into the following groups: Cereals and cereal foods; dairy products; meat, poultry, and game; fish; fruit; nuts; vegetables; sugar preserves and sweet meats; beverages; beer; condiments; vegetable fats; cakes and pastries; puddings; meat and fish dishes; egg and cheese dishes; sauces and soups. The arbitrary classification of several foods is clarified by a complete index. Ninety recipes used in the

preparation of the cooked dishes are given. The foods are analyzed for water; unavailable carbohydrate; sugar; starch (as glucose); total nitrogen; protein; fat; available carbohydrate; calories; sodium, potassium, calcium, magnesium, iron, copper, phosphorus, sulphur, and chlorine. The acid base values are expressed as cc. N/10 acid or alkaline. Two sets of tables are given. In one, the composition of the food is calculated in cc. per 100 grams, and in the other, in cc. per ounce.

A knowledge of the chemical composition of food is necessary for the dietary treatment of disease or the study of nutrition, and this book will be most helpful to anyone interested in these subjects.



The Hooker Scientific Library, operated as a non-profit institution by Central College, has inaugurated a new service for chemists who lack convenient access to chemical reference works. For a nominal fee the library will send the data on any question which can be answered by references to a chemical manual, dictionary or index, such as Beilstein, Mellor, Thorpe, Ullmann, formula indexes, and the like. Inquiries taking too much time for the low fixed rate will be answered at a proportionately higher cost, for which estimates can be rendered in advance. Full details will be sent in response to requests addressed to: Hooker Scientific Library, Central College, Fayette, Missouri.



Foster D. Snell, F.A.I.C., consulting chemist, Brooklyn, New York, has been elected president of the Alumni Association of The Graduate Schools of Columbia University.

The United States Department of the Interior, Bureau of Mines, announces the publication of the *Minerals Yearbook 1940*. The book presents an economic review and statistical summary of the mineral industry of the United States in 1939. The domestic situation with reference to strategic minerals is also shown. This publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is \$2.00.



The 1940 edition of *The Chemical Engineering Catalog* has just been issued by Reinhold Publishing Corporation, New York, N. Y. This publication, also known as *The Process Industries Catalog*, was inaugurated by The American Institute of Chemical Engineers in 1915. It contains condensed and standardized data on equipment, machinery, laboratory supplies, heavy and fine chemicals, and raw materials used in the industries employing chemical processes of manufacture. Classified indexes are carefully cross-referenced. A technical and scientific book section also adds to the usefulness of this publication.



The E. I. du Pont de Nemours and Company Dye Works, Deep Water, New Jersey, offer an opportunity to employees to study chemistry, engineering, foremanship, personnel relations, and other subjects at Rutgers University Extension Division on a cooperative price basis. Half the cost of tuition is refunded to employees who successfully complete a course. Last year 267 employees availed themselves of this offer.

NORTHERN LIGHTS

By Howard W. Post, F.A.I.C.

From *Canadian Chemistry & Process Industries* 24 482 (1940): "The following note relates to an incident that occurred at an early date in low-pressure tire research, a subject in which the late Harold van der Linde of Toronto was a real pioneer.

"In 1912, M. L. Allard—now with the United States Rubber Reclaiming Co., Inc., Buffalo—took a picture of two 'Grip Ground' tires, designed and manufactured under the direction of H. van der Linde and placed on the rear wheels of a motor-car of that date. This picture appeared recently in the *India Rubber World* in an account of low-pressure tire pioneering in some material gathered by Dr. G. S. Whitby, formerly of Ottawa, and now director of Chemical Research Laboratories at Teddington.

"So in 1912, with Allard operating a camera and van der Linde looking at the first low-pressure tires, the scene is set. At that time, van der Linde's chauffeur was his late father's coachman. He (that is, the coachman) was keenly aware of the changes in the times and the passing of the horse. The chauffeur,

at a respectable distance from this new contraption, took in what was going on. When the tires were mounted and inflated, in view of the fact that the regular high-pressure tires were still on the front wheels, the automobile was not level, giving the impression of being down at the tail. Skerns, the chauffeur, felt that someone should step into this evident emergency and do the best possible with these, to him, quite irresponsible and impracticable chemists. He stepped forward, begging his master's pardon. 'Sir,' said he, 'do you intend to run the car as now equipped?' van der Linde answered affirmatively. Skerns promptly retorted, 'I fear that with those lower tires on the back wheels our speed will be reduced and the consumption of gasoline will be increased.' Van der Linde requested an explanation, and Skerns came out with this perfect gem: 'We will be going uphill all the time, Sir!'"

Many of our members from Buffalo and vicinity know Mr. Allard and will be interested in this short story of his connection with the earlier days of the rubber industry on this continent.



Professor Edward Bartow, recently retired head of the department of chemistry and chemical engineering at the State University of Iowa, and past president of the American Chemical Society, is now research consultant for the Johns Manville Corporation, Manville, New Jersey.

Correction

The Grand Recorder of Alpha Chi Sigma Fraternity informs us that Alpha Chi Sigma is not "a national honorary professional society" as we stated on page 323 of the September issue of THE CHEMIST, but is "a national professional chemical fraternity".

THE SCIENCE ANGLER

Kenneth E. Shull, J.A.I.C.

Nowadays it is possible for one to acquire a full course, organoleptic dinner simply by opening the morning mail. Blotters perfumed with the fragrant aroma of dated coffee, stationery, scented with orange, lemon, grapefruit, butter, and every other imaginable article of food help make up this nasal diet. Even inks have received their share of odors.

And while the world is excitedly talking of this new method of advertising, may we calmly report that perfumed blotters were being used at least fifteen years ago.



Much attention has been given to the inefficient methods used by restaurants in the washing of dishes and other culinary equipment. As a step in remedying this unhealthy situation it has been suggested that certain chemical compounds, such as sodium metaphosphate, be added to the wash water. Used as a rinse, a solution of alkyl-dimethyl benzyl ammonium chloride has been found to be particularly effective in ridding eating and drinking utensils of harmful bacteria.

However there appears to be more to the problem than at first meets the eye. Recent studies on the washing of milk cans show that even after a cleaning with "harsh" detergents and steaming, a thin invisible bacteria-laden film remains adherent to the sides of the can. This can only be removed by use of a rinse containing citric, gluconic, or some such acid. The idea is to leave the can in an acid condition.

By the same token might not the use of an acid rinse prove to be beneficial in the restaurant business?

In an endeavor to throw more light on the subject, a new type of electric lamp has been invented. It consists of a glass tube filled with tellurium vapor. The light, very close to daylight, emanates from the glowing gas, not from any solid.



Doctors have long known that a sneeze helps spread disease, and have pleaded constantly for the use of a handkerchief to stymie such an aqueous blitzkrieg.

Recently the problem of the sneeze has been given considerable study with the aid of the Edgerton technique of high speed photography. By this means it has been found that thousands of small droplets, containing thousands of bacteria, are expelled with every outburst. Many are less than two mm. in diameter, and travel but two or three feet. It is interesting to note that, although many droplets fall to the ground, a goodly number evaporate, leaving their cargo of destruction suspended in the air for several hours and ready for some unsuspecting person.



So that we may better see what is going on in the world, chemists have developed a process whereby ordinary glass can be made more transparent. Treatment involves subjecting the surface of the glass to a weak acid solution under special controlled conditions.

Such a type of glass should find wide application in the manufacture of photographic lenses, telescopic lenses and, in fact, all optical lenses.

CHEMISTS

Industrial Chemical Conference

An Industrial Chemical Conference will be a feature of the National Chemical Exposition to be held December eleventh to fifteenth, at the Stevens Hotel, Chicago, Illinois. The conference will have, as its subject, "Newer Developments in Chemistry and Chemical Engineering". At the forenoon session on December twelfth, Bruce K. Brown, general manager of research and development, Standard Oil Company, Chicago, will preside. Walter G. Whitman of Massachusetts Institute of Technology will talk on "New Developments in Synthetic Chemicals and Materials for Fuels and Lubricants", followed by E. V. Murphree, vice-president of the Standard Oil and Development Company of New York, who will speak on "New Developments in Synthetic Chemicals and Materials in the Rubber Industry". The afternoon conference on December twelfth will be presided over by Harrison E. Howe, editor of *Industrial and Engineering Chemistry*. C. A. Elvehjem, F.A.I.C., professor of agricultural chemistry at the University of Wisconsin will speak on, "Service of Chemistry to Human Nutrition", and H. G. Knight, F.A.I.C., chief of the United States Bureau of Agricultural and Engineering Chemistry, will speak on the "Service of Chemistry to Agriculture". The program for Friday morning will have as its presiding officer C. D. Hurd of Northwestern University. Colin G. Fink of Columbia University will discuss "The Influence of Electrolytic Processes on the Development of the Chemical Industries". C. L. Gabriel, vice-president, Commercial Solvents Corporation, will speak on the "Influence of New Solvents on the Develop-

ment of the Chemical Industries"; followed by E. C. Britton, director of organic research of the Dow Chemical Company, who will talk on "The Influence of the Friedel-Crafts Reaction on the Development of the Chemical Industries". The conference on December fourteenth will be presided over by Allen Abrams, technical director of the Marathon Paper Mills. James A. Lee, Managing Editor of *Chemical and Metallurgical Engineering*, will talk on the "Effect of New Resistant Materials on Modern Industrial Chemical Development". L. W. Bass, F.A.I.C., of the Mellon Institute of Industrial Research, will speak on the "Effect of Economic Conservation of By-products on Modern Industrial Chemical Development". John J. Grebe, director of the physical laboratory of the Dow Chemical Company, will discuss the "Effect of Instruments for the Chemical Industries on Modern Industrial Chemical Development". Inquiries regarding the program or space applications for the exposition should be addressed to The National Chemical Exposition, 110 North Franklin Street, Chicago, Illinois.



Glyco Products Company, Inc., New York, N. Y., announce the removal of their Philadelphia Branch office to 2000 Franklin Trust Building, Fifteenth and Chestnut Streets, Philadelphia, Pennsylvania.



The Consumer's Testing Laboratory, Philadelphia, Pennsylvania, textile consultants, announce their removal to new and larger quarters at 725 Filbert Street.

Mead Johnson and Company will award \$1000 to promote researches dealing with the B-complex vitamin. "The award will be given to the laboratory (non-clinical) or clinical research worker in the United States or Canada who, in the opinion of the judges, has published from January first to December thirty-first, 1940, the most meritorious scientific report dealing with the field of the B-complex vitamin." Nominations for this award should be in the hands of the secretary of the American Institute of Nutrition, L. A. Maynard, Laboratory of Animal Nutrition, Cornell University, Ithaca, New York, by January 25, 1941. The award will be announced at the annual meeting of the American Institute of Nutrition to be held on April 16, 1941, in Chicago, Illinois.



Linus Pauling of the California Institute of Technology, Pasadena, California, will receive the William H. Nichols Medal of the American Chemical Society for "his distinguished and pioneer work on the application of quantum mechanics to chemistry and on the size and shape of chemical molecules".

The medal presentation will be made at a dinner at the Hotel Pennsylvania, New York, N. Y., on March 7, 1941.



Robert J. Moore, F.A.I.C., spoke on "Corrosion Resistance" at a symposium on "Modern Protective Coatings" held at the Museum of Science and Industry, Chicago, Illinois, on October twenty-third. Dr. J. S. Long of Devco and Raynolds Company was chairman of the meeting. Dr. C. H. Ellaby of the U. S. Engineers spoke on "Engineering Specifications."

National Registration of Chemists

Many of our readers have telephoned or written to get information about the national census of chemists and chemical engineers. The National Defense Council is preparing a National Roster of Scientific and Specialized Personnel, and has delegated the American Chemical Society to procure the enrollment of chemists and chemical engineers.

The American Chemical Society is sending questionnaires to its members bearing the stamp letters "A.C.S.". The same questionnaire carrying the caption, "National Roster of Scientific and Specialized Personnel", is being mailed to all chemists and chemical engineers who are not members of that society. If as a chemist you have not yet received your questionnaire, or if you received a Technical Check List which did not carry the caption "Chemistry", the secretary of the American Chemical Society, Mills Building, Washington, D. C., requests that you write him. These questionnaires have not all been mailed, but they are being sent out to various lists as rapidly as possible.



Columbia University has established the degree of Ph.D. in chemistry, according to an announcement by Professor Harold C. Urey, Head of the Department of Chemistry. Previously, candidates for the Ph.D. degree followed a prescribed curriculum, but under the new system graduate students need not enroll in a definite number of formal courses although they are expected to register in certain classes in order to prepare for their dissertations and examinations. Provision is also being made for greater financial assistance to those taking graduate work in chemistry.

According to a report from the American Consulate General in Calcutta, British India is experiencing some difficulty in obtaining certain chemicals. If shortages become more acute in certain industrial chemicals, fine chemicals and essential oils, there may be created a demand which can be met satisfactorily only in the United States.

Official statistics appearing in *Foreign Commerce Weekly* for ten months ended January 31, 1940, show imports of chemicals and allied products were valued at \$36,000,000, an increase of thirteen per cent over the comparable 1938-1939 period.

After the outbreak of the European war in September, interest in the development of new chemical industries became more prominent than previously. Plans were made for greater production in India of such items as dyes, bleaching materials for the textile industry, chlorine and its derivatives for water-works and sanitation purposes, drugs and medicines to replace foreign products, synthetic resins for use in molded products, and many other chemical items.



A meeting of the American Section of the Society of Chemical Industry, jointly with the American Institute of Chemical Engineers, will be held on Friday, November 15, 1940, at 8:15 P. M., at The Chemists' Club, 52 East 41st Street, New York, N. Y. The subject of the meeting will be "The Science and Application of Plastics". Dr. T. F. Bradley, F.A.I.C., of the American Cyanamid Company will present the chemistry of plastics and Mr. C. W. Blount of the Technical Sales Division of The Bakelite Corporation will show the scope of their application. Dr. Lincoln T. Work, Chairman of the

American Section, will preside over the meeting.

A dinner will be held prior to the meeting, at 6:30 P.M. Ladies and non-members of the cooperating societies are invited to attend both the dinner and the meeting.



Jerome Alexander, F.A.I.C., will give a short course in science, entitled "Some Relatively Recent Developments in Chemistry", under the auspices of The American Institute, 60 East 42nd Street, New York, N. Y. The first lecture will be given on November twelfth, at which theories and methods, the application of mathematics to physical and chemical problems, and new apparatus and procedures will be discussed. On November nineteenth, Dr. Alexander will talk about some novel products and processes from various fields of technology. The final lecture of the series will be given on November twenty-sixth, when the application of chemistry to some problems involved in normal life processes and in disease will be discussed.



A meeting of the American Pharmaceutical Association was held on October fourteenth at the Columbia University College of Pharmacy, New York, N. Y. Dr. Fred B. Western, Medical Director of Bilhuber-Knoll Corporation, Orange, N. J., spoke on "The Place of Chemotherapy in the Modern Treatment of Insanity"; and Dr. S. Bernard Wortis, Associate Professor of Neurology of New York University Medical College, discussed "The Clinical Aspect of Insulin, Metrazol, and Electrical Shock Therapy in the Treatment of Schizophrenia".

Boston Activities**By William B. O'Brien, F.A.I.C.****Meeting of the Boston Microchemical Society**

The Boston Microchemical Society met October sixteenth in the Mallinckrodt Chemical Laboratory. This local society is devoted to the development of microchemical technique and since 1938 has held seventeen meetings, in each of which a speaker prominent in his field used blackboard, lantern slides, and specialized instruments to give detailed information on analytical procedures, photographic, microscopic, colorimetric and other means of obtaining microchemical data. Officers of the society are J. R. Gettens, president; H. H. Straw, secretary, and T. R. P. Gibb, vice-president. Councilors are A. L. Kling, W. S. McGuire, H. O. Kuhlberg, E. A. Snow, all of whom are active in fields of chemistry where the usefulness of microchemical technique is recognized. The recent meeting was given over to a discussion on the polarograph, by Dr. E. B. Hershberg of the Harvard Chemical Laboratories. The polarograph is an apparatus for determination of small quantities of materials in solution by measurement of the polarization current with a dropping mercury electrode. Some commercial instruments automatically plot the current-voltage curves either on graph paper or sensitized photographic paper,

while others are manually operated. With the latter, the data must be plotted in order to obtain the familiar S-curve. In sensitivity the polarograph is comparable to the spectrograph, and metallic ion concentrations of the order of a few parts per million may be detected and determined. It finds application in many fields of organic and inorganic chemistry and opens a new approach to hitherto unsolved microchemical problems.



On October tenth, THE AMERICAN INSTITUTE OF CHEMISTS 1940 medalist, Dr. Gustav Egloff, was present at a dinner at the Graduate House of the Massachusetts Institute of Technology in Cambridge with the members of the American Chemical Society and later spoke before the society in Huntington Hall. His portrayal of the economic and technical features of petroleum conversion earned the sincere appreciation and thanks of the very large gathering. Dr. Egloff's unique photos of war-necessitated European substitutes for gasoline fueled motors now prevalent in European sections carried a very realistic touch of the horrors of total war.



Gustav Egloff, F.A.I.C., director of research, Universal Oil Products Company, Chicago, Illinois, is being awarded the Octave Chanute Medal of the Western Society of Engineers. The award is made for the best paper on mechanical engineering read before the society. Dr. Egloff's paper was on "Motor Fuels—Present and Future".

The University of Colorado dedicated its buildings to the cause of public education at a ceremony held June eighth and ninth at Boulder, Colorado. The University was established seventy-nine years ago. This ceremony commemorated the completion of a twenty-five year building plan to add to the effectiveness of the work of the University.

Are We Educating for National Defense?

A digest of a talk by Dr. Joel H. Hildebrand, Professor of Chemistry, Dean of the College of Letters and Science, University of California.

We have been accustomed in this country to regard "life, liberty, and the pursuit of happiness" as rights so natural as to be almost automatically self-perpetuating. The majority of us, however, have now been shocked into realizing that our Bill of Rights is not alone sufficient to guarantee the maintenance of these privileges. Although there is a noisy minority who say that it might not rain, there is hope that the more far sighted will drown out this council of inaction and that we may be able to mend the roof now so as to be prepared for rain whenever it comes.

Recent events have made it fairly clear that a nation today cannot safely hope to defend itself by "a million men springing to arms overnight". If the freedom to search for truth, whether in the press, the pulpit, the philosopher's study, or the scientist's laboratory, is to survive here with us, we shall have to support it with all of our resources—material, mental, and moral. An Athenian civilization can be long maintained only by citizens with Spartan qualities.

Now there are various ways of being tough. Tough bodies are an important asset in national strength. We might do better in this respect. Athletics for the majority are a matter of cheering in the grandstand. We take the elevator to ascend one floor, and we jump into an automobile to go three blocks. Of still greater importance is tough character, sustaining high ideals. There is still more room here for improvement. The grandstand attitude has also affected character.

But there is another element that has

been far less stressed to which I invite your attention, namely, active intelligence, well fortified by knowledge. Faith may lead but to delusion and a stout heart to stubbornness unless guided by intelligence. Tough moral fiber requires the support of a clear head. Integrity must extend to honest thinking and industry to hard mental effort. A soft head and a flabby character are partners. National strength requires not only strong muscles and sound character, but clear vigorous minds. Education which produces these makes an essential contribution to national strength, which is of value for peace or for war, for the welfare of the state and of the individual.

To work effectively with one's brain is not easy and there are several popular substitutes. One of these is sought in formulas derived in advance by someone else. The method suffers from two serious disadvantages. First, there are so many problems that it is impossible to remember all the formulas. Second, a new problem occurs for which no formula has been derived. Another substitute for straight thinking is "intuition". Still other substitutes for clear thinking, such as prejudice, passion, and slogans, are equally misleading. If education is to be effective in equipping one to meet new situations, it must afford a great deal of practice in the processes of solving problems by scientific analysis. This method is used in the progressive business as in the research laboratory. It involves experiment, search, and selection of data, judgment, induction, and deduction, and the unprejudiced testing of conclusions.

This is not a modern invention, but its large scale application is distinctly modern and the command we have gained over the material world is a direct result. An individual must be trained to his utmost capacity, if he is to be prepared for a life bristling with new problems.

Let us apply this touchstone to several stages of education. Let us begin with the education of military and naval officers. Here we run afoul of another necessary element of military training, discipline, not intellectual discipline but obedience to authority. An officer in a naval unit was explaining to his class the tendency of a torpedo to deviate from a straight course. The explanation appeared to a university student majoring in physics to reverse the actual fact. An instructor in physics would welcome such intellectual initiative on the part of a student but not that officer. He let it be distinctly understood that a cadet should not question the word of an officer. An officer of the chemical warfare service, during the last war, was standing beside an American general. The general pointed to a distant wood saying, "Look at the enemy advancing into the wood. I shelled it with gas about eight hours ago." The officer asked what kind of gas. The general replied, "What gas? Oh, just gas." Now, a modicum of scientific insight would have revealed to a properly trained man the absurdity of confusing a true gas such as phosgene, which would drift away in the wind, with a gas such as mustard which might remain for days. This general had been a professor of military science and tactics. Surely he should have been able to appreciate the kindergarden facts about the materials he used. A British chemist suggested the use of mustard gas as early as 1915, but the Army authority could not see it, until

two years later the Germans used it against them with terrible effect.

This slowness on the part of many military and naval men to invent or even appreciate novel ideas has been deplored by members of both services. Such an attitude towards innovation is highly inappropriate, in view of the long list of military successes that have been achieved by the aid of new inventions. I am criticising a system of education which is not productive of scientific thinking. Warfare is becoming a matter of science and engineering. It is waged by the entire nation rather than by a professional class. The nation must, therefore, be in a position to use its best brains and all of its technical and scientific knowledge. The training of officers for warfare cannot take place in institutions far removed from the creating and inquiring type of mind. We hear complaints that research distracts attention from teaching. There can be no great teaching by men who have too little curiosity to explore the frontiers of the fields they presume to teach. Our national defense would be vastly strengthened, if our military and naval academies became graduate professional schools for students recruited from institutions of engineering and scientific background.

Let us next consider our colleges and universities. We may note first that while our faculties and student bodies include valuable men who work from inner rather than outer compulsion, there are others whose ideal is to "get by". We can no longer tolerate these idlers. Most border-line students are able to meet higher standards if they must. Training in the art of clear thinking can be had only by serious effort. We must make more distinctions in the treatment of students of different grades of ability. A student capable of rapid progress should be released from

what Stephen Leacock calls "the Convo system", wherein everybody adopts the speed of the slowest. We can shift the emphasis from teaching to learning, from lectures to books and laboratories. We can appeal to reason rather than memory, and we can ask questions which present problems.

If the more advanced stages of education are to be successful, they must receive well-prepared material from below. This brings us to a consideration of the education offered in the high schools and grade schools. The preparation from different schools is very unequal. Much stress is placed in some schools on developing personality, making pupils happy, teaching them to "sell themselves", and adjust themselves to life. Well adjusted as they may be to the school, they often face serious readjustment when they find that the standards set by the professions are far more severe.

Tests given high school students show them woefully lacking in fundamental scientific education. The reasons for such a situation are that, in the first place, there are not enough male teachers in our schools. Students taught until the age of eighteen by women are not well-prepared for life in the existing world. This is especially serious in the case of mathematics and the sciences. In the second place, the emphasis in teacher training has been misplaced from subject matter to methodology and administration, and many teachers are assigned to teach subjects in which they have had no preparation whatever. As a third factor, I would name an over-emphasis on what is called social science. Mathematics, science, and languages have been under attack by the educational theorists and administrators and have been displaced to a great extent by such courses as "personal management", "social living", "citizenship",

or something misnamed "economics". The substitution of these subjects results in part from the realization that our political, social and economic problems are pressing. The fallacy consists in assuming that they are to be solved by ignorant teachers and minor children dabbling in them in high school. I would rather trust the teacher of arithmetic to protect us from "\$30 every Thursday" than the teacher of the so-called social science. Have the social studies produced better citizens? Have they produced higher ideals, greater loyalty, more self-reliance, a less self-centered outlook on life? I leave it to you to answer such questions. A fourth factor in the weakness of much school preparation is the domination of education by administrators and amateur philosophers. Formerly a high school principal would have years of successful teaching experience preceded by training in an old fashioned college that insisted upon real scholarship. Now a man may prepare for a principalship by devoting his attention largely to courses in school administration. There are several pseudo-scholarly procedures that such a principal is tempted to adopt. He may circulate questionnaires, he may think up a new word or slogan, or he may use a ponderous jargon. Here is a sample: "Society consists of persons plus psycho-social processes plus the products of these processes plus the patterns which result from them. The whole system of relationship between these factors is what the sociologist calls culture." The poor teachers have to put up with such nonsense and change their teaching methods to accord. "How many of us would employ a physician who had spent one year studying the diseases of the body and six more on how to approach a patient?" I suggest that as citizens you call off the administrators and social theorists and

give the teachers a chance. The serious outlook for our future demands a return to more solid education. We should get back to work. Those who cannot work effectively with their brains should work with their hands. Overalls and aprons are as honorable as academic robes.

These remedies can furnish only part of the vitality the nation needs, but they are an essential part. We must become stronger in materials and in character, but also in trained intelligence. If we are determined to survive, we must educate for national strength.

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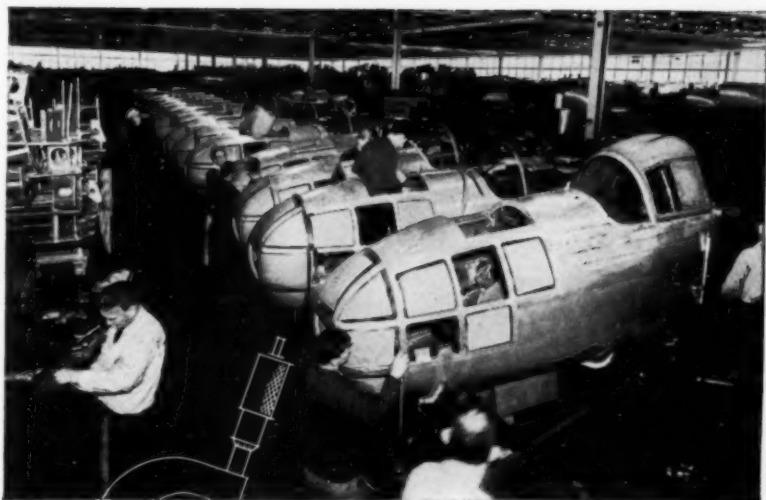
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